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Gender of fungal generic names ending in *–trema*

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Abstract—Fungal generic names ending in *–trema* are reviewed. Most are derived from the latinised Greek neuter noun meaning "perforation; aperture; opening; orifice." However, some are Latin feminine, with *–trema* referring to a relationship or similarity to *Tremella*.

Key words—etymology, epithet gender, lichens, nomenclature, *Tremellales*

Introduction

Numerous fungal generic names ending in *–trema* are derived from the Greek neuter noun τρημα, meaning "perforation; aperture; opening; orifice." Most of these are lichen genera, with names referring to characteristics of their ascomatal ostioles.

It has been widely assumed that all generic names ending in *–trema* have neuter gender, regardless of their etymology. However, there are several tremellalean genera where the ending *–trema* has been treated as a Latin feminine, apparently intended as an abbreviation alluding to their affinity with *Tremella*.

A similar mix of implied genders occurs among botanical and algal names. Of 14 plant genera ending in *–trema* (IPNI 2022), nine have neuter species epithets, four have feminine epithets, and one has no listed species. Of seven algal genera ending in *–trema* (AlgaeBase 2022), two have neuter species epithets, three have feminine epithets, and two have no listed species; moreover the AlgaeBase website explicitly lists the "accepted gender" of three of these genera—one as neuter and two as feminine. The protologues of these botanical

and algal genera need to be checked to confirm whether or not they are derived from Greek τρημα.

Here, a listing of all fungal *–trema* genera is presented, with the evidence for their gender compiled and annotated, including comments on the orthography of higher taxon names typified by such genera.

Materials & methods

Two of the three major fungal nomenclature websites, Index Fungorum (2022) and MycoBank (2022), were interrogated to compile a list of all fungal *–trema* genera. Evidence of their gender was ascertained by investigating: (a) the gender of adjectival epithets published by the original and subsequent authors of species; (b) etymologies (either published or implied by the generic descriptions); and (c) the orthography of higher taxa typified by them.

Results & discussion

Fifty fungal genera ending with *–trema* were located and classified into four groups: 35 lichenised neuter genera; eight non-lichenised neuter genera; six Latin feminine genera; and one microsporidial (feminine?; neuter?) genus.

Lichenised genera with names based on Greek τρημα (neuter)

Mycasterotrema is a nomen nudum; and *Prototrema* is rather obscure and apparently has no named species. All but two of the remaining 33 genera in this group have neuter adjectival epithets, either in the holotype or in other species (if the holotype epithet is gender uninformative). *Sanguinotrema* (*Graphidaceae*) is a monotypic genus with an uninformative epithet. *Xerotrema* (*Odontotremataceae*) was published as a monotypic genus with a feminine holotype epithet and a subsequently included second species has an uninformative epithet; I have corrected the holotype epithet to the neuter form.

Four tribes, four families, and one order are typified by genera in this group; these names are formed from Greek neuter linguistic stems, resulting in the terminations ***–trematea****e,* ***–trematac****eae,* or ***–trematal****es.*

Acanthotrema Frisch (Frisch 2006: 77)
Type: *Acanthotrema brasilianum* (Hale) Frisch

Amazonotrema Kalb & Lücking (Kalb 2009: 18)
Type: *Amazonotrema nigrum* Kalb & Lücking

Ampliotrema Kalb (Frisch 2006: 81)
Type: *Ampliotrema amplius* (Nyl.) Kalb [a neuter comparative epithet]

Asterotrema Müll. Arg. (Müller [Argovensis] 1884: 19)
Type: *Asterotrema parasiticum* Müll. Arg.

Austrotrema I. Medeiros, Lücking & Lumbsch (Medeiros & al. 2017: 14)
Type: *Austrotrema bicinctulum* (Nyl.) I. Medeiros & al.

Borinquenotrema Merc.-Díaz, Lücking & Parnmen (Mercado-Díaz & al. 2014: 191)
Type: *Borinquenotrema soredicarpum* Merc.-Díaz & al.

Byssotrema M. Cáceres, Aptroot & Lücking (Cáceres & al. 2014: 91)
Type: *Byssotrema mirabile* M. Cáceres & al.

Clandestinotrema Rivas Plata, Lücking & Lumbsch (Rivas Plata & al. 2012a: 116)
Type: *Clandestinotrema clandestinum* (Ach.) Rivas Plata & al.

Coccotrema Müll. Arg. (Müller [Argovensis] 1889: 171)
Type: *Coccotrema antarcticum* Müll. Arg.
Coccotremataceae Henssen ex J.C. David & D. Hawksw. (David & Hawksworth 1991: 14)

Compositrema Rivas Plata, Lücking & Lumbsch (Rivas Plata & al. 2012b: 1172)
Type: *Compositrema cerebriforme* J.E. Hern. & Lücking

Conotrema Tuck. (Tuckerman 1848: 278)
Type: *Conotrema urceolatum* (Ach.) Tuck.

Cruentotrema Rivas Plata, Papong, Lumbsch & Lücking (Rivas Plata & al. 2012a: 116)
Type: *Cruentotrema cruentatum* (Mont.) Rivas Plata & al.

Cryptoschizotrema Aptroot, Lücking & M. Cáceres (Hyde & al. 2019: 129)
Type: *Cryptoschizotrema cryptotrema* (Nyl.) Aptroot & al.
Additional sp.: *Cryptoschizotrema minus* E.L. Lima & Lücking [a neuter comparative epithet] (Lima & al. 2019: 417)

Enigmotrema Lücking (Sipman & al. 2012: 66)
Type: *Enigmotrema rubrum* Lücking

Glaucotrema Rivas Plata & Lumbsch (Rivas Plata & al. 2012b: 1174)
Type: *Glaucotrema glaucophaenum* (Kremp.) Rivas Plata & Lumbsch

Gymnotrema Nyl. (Nylander 1858: 119)
Type: *Gymnotrema atratum* (Fée) Nyl.

Gyrotrema Frisch (Frisch & Kalb 2006: 379)
Type: *Gyrotrema sinuosum* (Sipman) Frisch

Leptotrema Mont. & Bosch (Montagne 1856: 363)
Syntypes: *Leptotrema zollingeri* Mont. & Bosch; *L. prevostianum* (Mont.) Mont.
Leptotremateae Lumbsch, Kraichak & Lücking (Lumbsch & al. 2014: 47)

Melanotrema Frisch (Frisch & Kalb 2006: 382)
Type: *Melanotrema platystomum* (Mont.) Frisch

Mycasterotrema Räsänen (Räsänen 1943: 22, as "[435. Mycasterotrema Räs.]", nom. nud.)
= *Asterotrema* Müll. Arg. (Lamb 1963: 421)

Myriotrema Fée (Fée 1825: xlix, 103)
Type: *Myriotrema olivaceum* Fée

Odontotrema Nyl. (Nylander 1858: 143)
Type: *Odontotrema phacidioides* Nyl.
Additional sp.: *Odontotrema minus* Nyl. [a neuter comparative epithet] (Nylander & Saelan 1859: 91)
Odontotremataceae D. Hawksw. & Sherwood (Hawksworth & Sherwood 1982: 263)
Odontotrematales Lücking (Lücking 2019: 233)

Parmotrema A. Massal. (Massalongo 1860: 248)
Type: *Parmotrema perforatum* (Jacq.) A. Massal.

Phaeotrema Müll. Arg. (Müller [Argovensis] 1887: 10)
Type: *Phaeotrema subfarinosum* (Fée) Müll. Arg.

Plagiotrema Müll. Arg. (Müller [Argovensis] 1885: 387)
Type: *Plagiotrema cubanum* Müll. Arg.

Pleurotrema Müll. Arg. (Müller [Argovensis] 1885: 388)
Type: *Pleurotrema polysemum* (Nyl.) Müll. Arg.
Pleurotremataceae Walt. Watson (Watson 1929: 113)

Prototrema M. Choisy (Choisy 1928: tab. 18)
= *Thelotrema* Ach. (Lamb 1963: 595)

Pycnotrema Rivas Plata & Lücking (Rivas Plata & al. 2012a: 120)
Type: *Pycnotrema pycnoporellum* (Nyl.) Rivas Plata & Lücking

Sanguinotrema Lücking (Lücking & al. 2015: 441)
Type: *Sanguinotrema wightii* (Taylor) Lücking
Sanguinotremateae Lücking, Kraichak & Lumbsch (Lücking & al. 2015: 442)

Schizotrema Mangold & Lumbsch (Mangold & al. 2009: 348, 657)
Type: *Schizotrema zebrinum* Mangold

Thelotrema Ach. (Acharius 1803: 130)
Type: *Thelotrema lepadinum* (Ach.) Ach.
Thelotremateae Rivas Plata, Lücking & Lumbsch (Rivas Plata & al. 2012a: 114)
Thelotremataceae Stizenb. [as "*Thelotremeae*"] (Stizenberger 1862: 167)

Trichotrema Clem. (Clements 1909: 41, 173)
Type: *Trichotrema trichosporum* (Müll. Arg.) Clem.

Trinathotrema Lücking, Rivas Plata & Mangold (Lücking & al. 2011: 195)
Type: *Trinathotrema stictideum* (Nyl.) Lücking & al.

Wirthiotrema Rivas Plata, Kalb, Frisch & Lumbsch (Rivas Plata & al. 2010: 198)
Type: *Wirthiotrema glaucopallens* (Nyl.) Rivas Plata & Kalb
Additional sp.: *Wirthiotrema duplomarginatum* Lücking & al. (Sipman & al. 2012: 202)
Wirthiotremateae Lumbsch, Kraichak & Lücking (Lumbsch & al. 2014: 47)

Xerotrema Sherwood & Coppins (Sherwood & Coppins 1980: 368)
Type: *Xerotrema megalosporum* Sherwood & Coppins [as "*megalospora*"]

Non-lichenised genera with names based on Greek τρημα (neuter).

The eight genera in this group are from diverse asco- and basidiomycete families or orders (as annotated below). *Hydnotrema* is illegitimate and *Sistotrema* Pers. is an unavailable earlier homonym of a sanctioned name; both have been synonymised with other legitimate genera. The other six genera have either neuter adjectival or gender uninformative epithets. In some of these generic names, latinised Greek neuter *trema* has been used as an ending analogous to latinised Greek neuter *stoma* (with very similar meanings); e.g., *Lophiotrema* was proposed as a sister genus to *Lophiostoma* (Saccardo 1878: 338–339). Three of the other generic names were created by adding prefixes to *Lophiotrema*.

Four families are typified by genera in this group; these names are formed from Greek neuter linguistic stems, resulting in the termination ***-trema****taceae*.

Antealophiotrema A. Hashim. & Kaz. Tanaka (Hashimoto & al. 2017: 68) [*Pleosporales*]
Type: *Antealophiotrema brunneosporum* (Ying Zhang & al.) A. Hashim. & Kaz. Tanaka

Echinotrema Park.-Rhodes (Parker-Rhodes 1955: 367) [*Hydnodontaceae*]
Type: *Echinotrema clanculare* Park.-Rhodes
Echinotremataceae Jülich (Jülich 1982: 366)

Hydnotrema Link (Link 1833: 298) [*Hydnaceae*], nom. illeg.; ≡ *Sistotrema* Fr. 1821, nom. sanct.
Type: *Hydnotrema confluens* (Pers.) Link; ≡ *Sistotrema confluens* Pers. 1794

Lophiotrema Sacc. (Saccardo 1878: 338) [*Lophiotremataceae*]
Type: *Lophiotrema nucula* (Fr.) Sacc. [a noun in apposition]
Additional spp.: *Lophiotrema alpigenum* (Fuckel) Sacc.; *L. nuculinum* (Rehm) Sacc.; *L. semiliberum* (Desm.) Sacc.; *L. sexnucleatum* (Cooke) Sacc.
Lophiotremataceae K. Hiray. & Kaz. Tanaka (Hirayama & Tanaka 2011: 405)

Neolophiotrema G.C. Ren & K.D. Hyde (Ren & al. 2021: 28) [*Anteagloniaceae*]
Type: *Neolophiotrema xiaokongense* G.C. Ren & K.D. Hyde

Pseudolophiotrema A. Hashim. & Kaz. Tanaka (Hashimoto & al. 2017: 70) [*Pseudolophiotremataceae*]
Type: *Pseudolophiotrema elymicola* A. Hashim. & Kaz. Tanaka
Pseudolophiotremataceae K.D. Hyde & Hongsanan (Hongsanan & al. 2018: 97)

Sistotrema Fr. (Fries 1821: 426, nom. sanct.) [*Hydnaceae*]
Type: *Sistotrema confluens* Pers. 1794, nom. sanct.
Sistotremataceae Jülich (Jülich 1982: 390)

Sistotrema Pers. (Persoon 1794: 108) [*Cerrenaceae*]; legitimate but unavailable (ICN 2018: Art. F.3.4); ≡*Cerrena* Gray (Gray 1821: 649)
Type: *Sistotrema cinereum* Pers.; = *Cerrena unicolor* (Bull.) Murrill (Murrill 1903: 91)

Generic names formed from Latin *trema* (feminine)

Five genera in this group are in *Tremellales* and have species with feminine adjectival epithets. A sixth, *Sclerotrema*, is a monotypic genus in *Auriculariales* but has an etymology explicitly defining *trema* as a reference to tremellaceous fungi; I have corrected its neuter holotype epithet to the feminine form. Two families are typified by genera in this group; these names are formed from Latin feminine linguistic stems, resulting in the termination ***–tremaceae***.

Cuniculitrema J.P. Samp. & R. Kirschner (Kirschner & al. 2001: 155) [*Tremellales*]
Type: *Cuniculitrema polymorpha* R. Kirschner & J.P. Samp.
Cuniculitremaceae J.P. Samp., R. Kirschner & M. Weiss (Kirschner & al. 2001: 155)

Gelidatrema Yurkov, Xin Zhan Liu, F.Y. Bai, M. Groenew. & Boekhout (Liu & al. 2015: 138) [*Tremellales*]
Type: *Gelidatrema spencermartinsiae* (V. de García & al.) Yurkov & al.
Additional sp.: *Gelidatrema psychrophila* M. Tsuji (Tsuji & al. 2018: 69)

Papiliotrema J.P. Samp., M. Weiss & R. Bauer (Sampaio & al. 2002: 875) [*Tremellales*]
Type: *Papiliotrema bandonii* J.P. Samp. & al.
Additional sp.: *Papiliotrema aurea* (Saito) Xin Zhan Liu & al. (Liu & al. 2015: 126)

Rhynchogastrema B. Metzler & Oberw. (Metzler & al. 1989: 281) [*Tremellales*]
Type: *Rhynchogastrema coronata* B. Metzler & Oberw.
"Etym.: Rhynchos (Gr.) – beak, gaster (Gr.) – body, belly, *Tremella*."
Rhynchogastremaceae Oberw. & B. Metzler (Metzler & al. 1989: 283)
"*Rhynchogastremataceae*" (Liu & al. 2015: 125) [an orthographic error]

Sclerotrema Spirin & Malysheva (Malysheva & Spirin 2017: 712) [*Auriculariales*]
Type: *Sclerotrema griseobrunnea* (K. Wells & Raitv.) Spirin & Malysheva [as "*griseobrunneum*"]
"Etymology. 'skleros' (Greek, adj.) – dry, and 'trema' – a reference to tremellaceous fungi, . ."

Sirotrema Bandoni (Bandoni 1986: 668) [*Tremellaceae*]
Type: *Sirotrema pusilla* Bandoni

Genus name in *Microsporidia* (feminine?; neuter?)

Although *Microsporidia* are now categorised as fungi, their names continue to be governed by the International Code of Zoological Nomenclature (ICN 2018: Art. F.1.1).

The etymology of *Systenostrema* identifies the first element *systenos-* as Greek, and the assumption would be that both elements are Greek. However, from the etymology, the authors appear to interpret *-trema* as meaning "thread" (= Greek neuter *nema*). There is nothing in the morphology of the genus that suggests the Greek etymology *-trema*, meaning "opening".

Like the Botanical Code, the Zoological Code requires adjectival epithets to agree with the gender of the genus (ICZN 2000: Art. 31.2). Two of the five *Systenostrema* species have feminine epithets (the other three are gender uninformative), but there is no connection with *Tremella*. The speculation arises that the authors were either treating *-trema* as a "meaningless" feminine suffix (cf. *-ella* and *-opsis*); or that *-trema* was an error for *-nema*, both of which would have required neuter adjectival epithets.

Systenostrema E.I. Hazard & Oldacre (Hazard & Oldacre 1976: 87) [*Microsporidia*]
Type: *Systenostrema tabani* E.I. Hazard & Oldacre
Etymology: "We name this genus *Systenostrema*, meaning "thread tapering to a point" and relating to the polar filament which abruptly constricts to a narrow distal portion."
Additional spp.: *Systenostrema alba* J.I.R. Larss.; *S. candida* J.I.R. Larss. (Larsson 1988: 16)

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